

[0035] What is claimed is:

- 1 1. A high bandwidth semiconductor photodiode responsive to incident
2 electromagnetic radiation comprising:
3 an absorption narrow bandgap layer;
4 a wide bandgap layer disposed substantially adjacent to the absorption
5 layer;
6 a first doped layer having a first conductivity type disposed substantially
7 adjacent to the wide bandgap layer; and
8 a passivation region disposed substantially adjacent to the wide bandgap
9 layer and the first doped layer.
- 1 2. The semiconductor photodiode of claim 1 further comprising a second
2 doped layer disposed substantially adjacent to the absorption narrow
3 bandgap layer.
- 1 3. The semiconductor photodiode of claim 2 further comprising a third
2 doped layer disposed substantially adjacent to the first doped layer and
3 adapted to form an ohmic contact with a substantially adjacent
4 metalization layer.
- 1 4. The semiconductor photodiode of claim 1 further comprising:
2 a second doped layer; and
3 an impact layer disposed substantially adjacent to the second doped layer
4 and the absorption narrow bandgap layer,

wherein the ratio of the ionization coefficient for electrons relative to the ionization coefficient for holes for the impact layer is larger than the corresponding ratio for the absorption narrow bandgap layer, the wide bandgap layer, the first doped layer, and the second doped layer.

5. The semiconductor photodiode of claim 1 wherein the first doped layer comprises indium phosphide

6. The semiconductor photodiode of claim 1 wherein the absorption layer comprises indium gallium arsenide.

7. The semiconductor photodiode of claim 1 wherein the wide bandgap layer varies in thickness from an etching thickness t_1 to a deposition thickness t_2 .

8. A method for fabricating a shallow mesa semiconductor photodiode, comprising the steps of:

generating an absorption narrow bandgap layer;

generating a wide bandgap layer disposed substantially adjacent to the absorption narrow bandgap layer;

generating a first doped layer disposed substantially adjacent to the wide bandgap layer, the first doped layer having a first conductivity type;

etching a region of the first doped layer;

etching a region of the intrinsic wide bandgap layer; and

generating a passivation region disposed substantially adjacent to the first doped layer and the intrinsic wide bandgap layer.

- 1 9. The method of claim 8 further comprising generating a second doped
2 layer disposed substantially adjacent to the absorption narrow bandgap
3 layer.
- 1 10. The method of claim 9 further comprising generating a third doped layer
2 disposed substantially adjacent to the first doped layer and capable of
3 forming an ohmic contact with a substantially adjacent metalization layer.
- 1 11. The method of claim 8 further comprising:
2 generating a second doped layer; and
3 generating an impact layer disposed substantially adjacent to the second
4 doped layer and the absorption narrow bandgap layer,
5 wherein the ratio of the ionization coefficient for electrons relative to the
6 ionization coefficient for holes for the impact layer is larger than the
7 corresponding ratio for the absorption narrow bandgap layer, the wide
8 bandgap layer, the first doped layer, and the second doped layer.
- 1 12. The method of claim 11 further comprising generating a third doped
2 layer disposed substantially adjacent to the first doped layer and capable
3 of forming an ohmic contact with a substantially adjacent metalization
4 layer.
- 1 13. The method of claim 8 wherein the first doped layer comprises indium
2 phosphide.
- 1 14. The method of claim 8 wherein the absorption layer comprises indium
2 gallium arsenide.
- 1 15. The method of claim 8 wherein the wide bandgap layer varies in
2 thickness from an etching thickness t_1 to a deposition thickness t_2 .